

Safety Management Systems for Maintenance Organizations: A U.S. Air Carrier Perspective

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Introduction

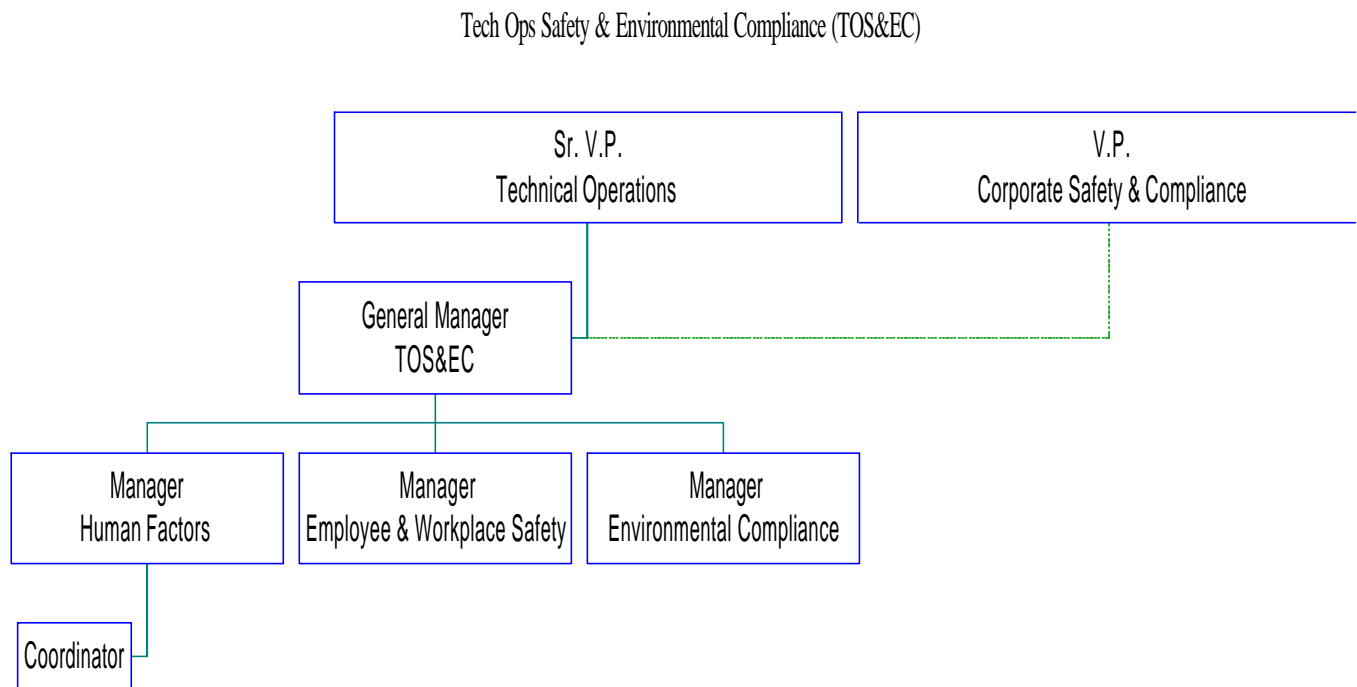
This paper will detail the efforts of Delta Air Lines Technical Operations to achieve an integrated safety management system (SMS). Human factors programs and processes are inclusive of an integrated safety management system and will be discussed here as well.

Background

Delta Air Lines Technical Operations Safety was formed in 1998 to address division-specific safety issues in the areas of airworthiness safety, human factors, employee and workplace safety, and environmental compliance. Staff exist to oversee each of these key areas to ensure that strategic and programmatic issues are addressed in a manner that ensures safety and compliance. As the department has matured, its focus has been refined to reflect the current business strategy at Delta, as well as to take advantage of evolving regulatory initiatives that have been formulated to address safety and human factors issues within airline technical operations.

Structure

Delta's Tech Ops safety organization is portrayed below:



The manager-human factors position was added to the department in 1999. Originally the duties of the position were to be primarily maintenance resource management (MRM) program development and delivery, As the author became more familiar with the corporate culture, it became immediately apparent that what was needed though was an integrated approach to safety management, inclusive of human factors efforts such as MRM. To that end, a project team was established in mid 2000 to specifically address a divisional strategic initiatives called the “Safety and Quality Culture Initiative.” The initiative has seven primary deliverables as follows:

- A divisional communication plan
- A safety and quality culture survey
- A revised organizational chart to reflect functional responsibilities
- A budget schedule reflective of initial and long-term resource requirements
- A divisional learning plan
- A safety management system
- A dedicated budget to achieve the above

Why safety and quality *culture*? Perhaps before that question is answered, safety culture needs to be defined. One definition that fits is: “a shared set of views, beliefs, values, and, most importantly, behaviors that govern risk management within a corporation” (Lauber, 2000). Throughout the 1999-2000 timeframe, safety and compliance events e.g., technical flight exceptions and voluntary self-disclosures that were internally investigated within Delta Technical Operations continually pointed to multiple causes that had their origins in areas such as 1) compliance system breakdowns 2) configuration control confusion 3) multiple independent information systems 4) individual at-risk behaviors, and 5) resource limitations. For these reasons, it was apparent to all that a multi-faceted cultural approach to reducing both the frequency and severity of these events was required

Our Journey

As the vision and need for an integrated safety management system (SMS) took shape internally, other industry occurrences accelerated the need for it. Additional to safety and compliance events at Delta, were such things as the Alaska Airlines accident and resultant National Safety Inspection (NSI) program initiated by the U.S. Federal Aviation Administration (FAA). Central to the timing of an SMS within Delta Technical Operations was an already strong corporate commitment to safety as reflected by the safety policy statement of Delta President and Chief Executive Officer Leo F. Mullin (1998):

“Safety is a critical component of Delta’s business strategy. We are committed to a level of reliability that makes us the best airline in the world. The first building block to reliability is safety. Therefore, the safety and well-being of Delta people and customers takes priority over every other aspect of our airline. That is our moral obligation , and it is good business.”

Absent a regulatory mandate from the FAA to create and maintain a safety management system, other sources were researched for information on how to effect a safety management system within an airline. Recent regulatory changes initiated from Transport Canada (TC) prescribing maintenance quality and safety programs, as well as guidance material published by the U.K. Civil Aviation Authority (CAA) on safety management systems provide the level of detail necessary to formalize our efforts.

Additionally, Delta’s operational compliance program contains the following elements indicative of a strong safety and compliance culture that serve as the foundational starting points for an SMS:

- Corporate programs to ensure that quality is designed into operational procedures and policies
- Critical safety processes (that) are independently and objectively reviewed
- Compliance and safety status is reported in an accurate and timely manner
- Resolution of safety and compliance concerns is swift and thorough

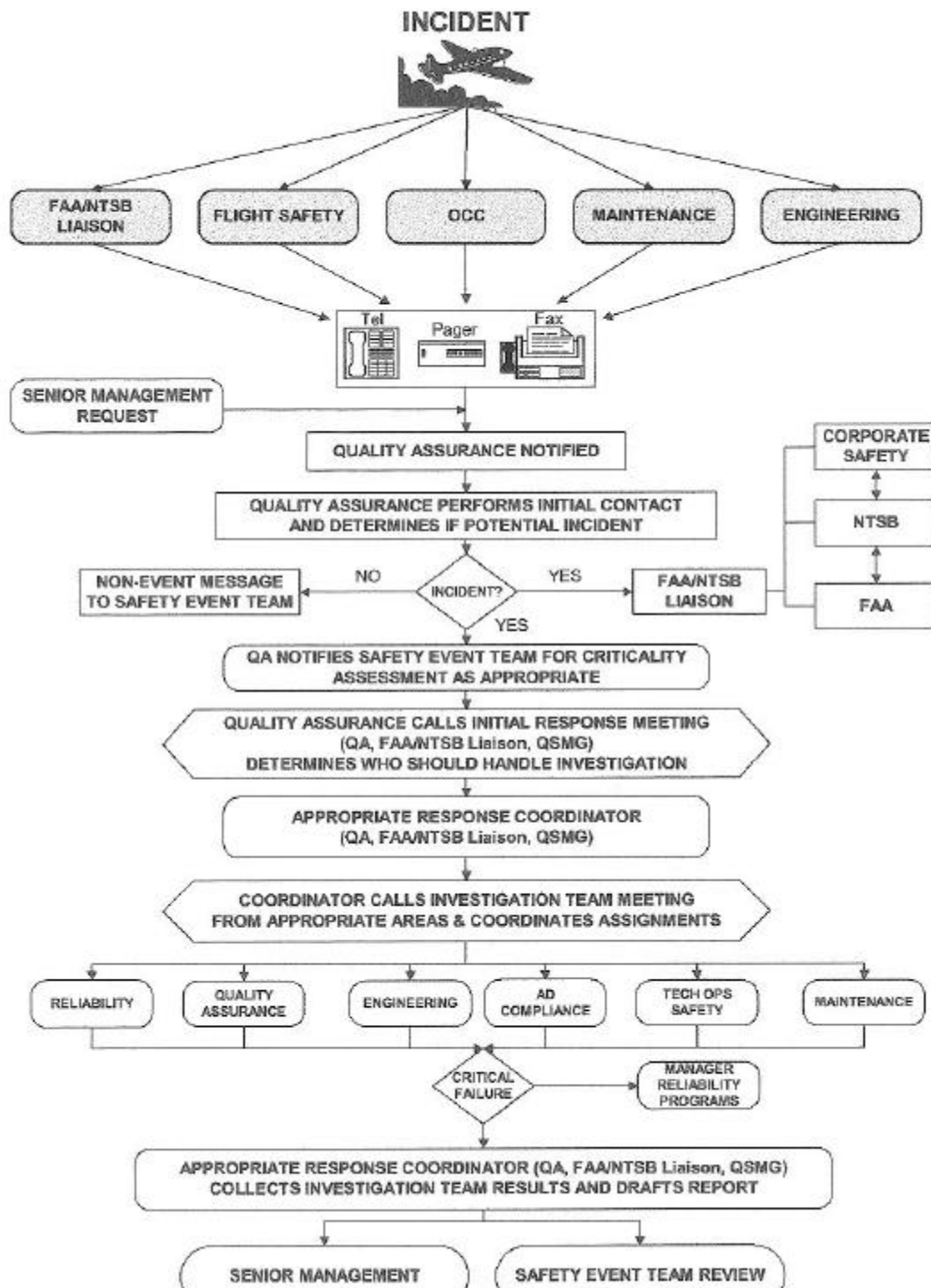
Our Process

Table 1 below provides a visual representation of how we are structuring our safety management system (SMS) within Delta Technical Operations to encompass relevant elements from Transport Canada (TC) regulation CAR (STD) 573.09 and 573.09 Appendix A (Maintenance Quality and Safety Program Requirements) and U.K. CAA guidance material OSD SMS (Safety Management Systems), and considering our own culture and business requirements.

Table 1

Delta Tech Ops Program Elements	Program Element Active Y/N	Transport Canada Program Elements*	U.K. CAA SMS Guideline Elements
Written Safety Program Ref: Safety Policy Manual (SPM) 81	Yes	Maintenance Safety Management Plan	Safety Management Policy and Principles & Procedures
Written Safety Program-SPM 81	Yes	Safety Program Manager Responsibilities	Section 3.3 - Safety Responsibility
Tech Ops Policies & Procedures (TOPP) Section 00-10-65: Organizational Structure	Yes	Safety Management Personnel Responsibilities	Section 4.1.4 - Personnel Competency
Safety Training Program-SPM 81	Yes	Safety Management Training Requirements	Section 4.1.4- Personnel Competency
Tech Ops Hotline, Delta Notification System (DNS), Safety Event Team (SET), Quality Assurance Event Investigation Process	Partial	Data Collection Procedures	Safety Assurance Documentation
Maintenance Event Safety Analysis (MESA), Safety Event Team (SET), and Incident Analysis Tool	Yes	Incident Analysis Procedures	
OARS, SET, & Quality Assurance Event Investigation Process	Yes	Reporting Procedures	
Safety Event Team (SET) & Tech Ops Safety and Compliance Board and Executive Committee (TOS&CB/TOS&CEC) Structure	Yes	Incident Analysis Procedures-Hazard Identification and Risk Analysis	Risk Assessment Methodology
		*Specific to airline maintenance operations	

As can be seen from the table above, each program element could be the topic of a paper in itself! However, one example of how we are trying to tailor a safety management system approach for our organization can be seen through the Technical Operations safety event team (SET) process (below). The SET process has been in place since early 2000, and has two primary elements; 1) a methodology for initial assessment of event criticality and immediate action that may be required and, 2) a monthly review and potential severity classification of all events occurring in the previous month, including executive-level review of classes of events that have high severity potential, or that require safety-related capital.



A recent addition to this process has been the executive oversight provided by the Technical Operations Safety and Compliance Board and Technical Operations Safety and Compliance Executive Committee (TOS&CB/TOS&CEC). These activities meet monthly, and have solidified the safety and compliance event management activities for the division by providing a venue for resolution of issues that have been trending adversely, or may require long-term engineering or capital solutions. This process serves as one example of how we are integrating single-event management with divisional strategic direction to reduce frequency and severity of events.

Our Challenges

With the cultural justification for an SMS done, and a large part of the safety management processes underway, our challenge turns to the following three issues:

- 1) How to ‘document’ these processes so that they are standardized and useable to various business units within Technical Operations
- 2) How to expand processes that (typically) have been created to satisfy employee and workplace safety requirements into processes that encompass airworthiness safety and compliance issues
- 3) Where to integrate human factors within an SMS

Regarding documentation, a 2001-2002 initiative within Technical Operations is to move towards a ‘quality manual system’ as specified by ISO9001 standards. This quality manual system will provide the appropriate framework for our SMS.

Regarding expansion of safety process, the first task will be to address the written safety program requirements so that they encompass metrics and training requirements that have connectivity to operational performance. This issue will be central to the long-term success of our “safety & quality culture” strategy.

The third challenge is more formidable i.e., where to integrate human factors? The simple answer is: everywhere! The more complex answer is: human factors-based interventions to safety and compliance incidents that are facilitated by human error (and not captured through systems) often must be managed by the application of human factors awareness that shapes behavior. This awareness is most often obtained through maintenance resource management (MRM) training. Our approach to this issue has been to focus on stabilizing our safety management processes, understanding our culture, and understanding the effects of our work processes before launching into a large scale human factors training exercise where we were not certain that human factors training was the intervention needed.

Table 2 below portrays the curriculum that is now being developed as the solution to our MRM requirements. Of note is the fact that it very heavily oriented towards safety and compliance (even in the course title), and thus becomes an integral part of the training requirements portion of our SMS.

Table 2

Safety & Standards Course Outline

<u>Module</u>	<u>Module Objectives</u>
1. Introduction	Establish: <ul style="list-style-type: none"> • why this training exists: <ul style="list-style-type: none"> ⇒ foster enhanced safety & compliance ⇒ protect our people ⇒ build teams ⇒ invest in our people • capture expectations • establish ground-rules
2. Safety & Compliance Policy Overview	Establish awareness and requirements of new or revised Tech Ops & Delta safety and compliance policies
3. Safety & Quality Culture initiative overview	Preview components of the S&Q initiative
4. Safety & Compliance Resources	Preview tools available to enhance safety & compliance
5. Event Data	Review Safety Events and contributing factors-illustrating need for this training
6. Human Factors Theory	Tie errors/events to underlying human performance concepts
7. Safety & Compliance Event Policy	Define/review disciplinary policy and procedural justice after a safety or compliance event
8. Safety & Compliance Event Resources	Define where employees can turn for assistance following a safety or compliance event

Conclusion

As can be seen from the multitude of program elements and some of the challenges listed, ours is not a “band-aid” approach, but one of legitimate culture change. Our business philosophy and commitment are aligned to allow this change to occur, and we are in agreement that now is the right time to proceed with an SMS effort. A fitting conclusion to this paper can be found in recent comments provided by Transport Canada management (Sheritt and Booth-Bordeau, 2000) regarding safety management:

“safety management involves a top down commitment to safety first and foremost. A safety culture doesn’t just happen, it has to be nurtured and empowered by the total commitment of the company to do whatever it takes to improve safety. This involves training, awareness, compliant behavior, and the adoption of a safety program that will provide the tools necessary to identify and correct safety deficiencies.”

At Delta Technical Operations, our journey is underway.

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